PECAN CREEK, GAINESVILLE, TEXAS
DETAILED PROJECT REPORT
AND INTEGRATED ENVIRONMENTAL ASSESSMENT

APPENDIX C.4
STRUCTURAL ENGINEERING

1. EXISTING CONDITIONS

a. BRIDGES – There are seven in the study area. Bridges cross over Pecan Creek at Belcher Street, East Scott Street, East California Street, East Main Street, East Garnett Street, and Moss Street. In addition, there is a pedestrian bridge and abutments left from a demolished bridge located in Jaycee Park. The abandoned abutments appear to be left from a demolished bridge for an old rail spur.

b. Belcher Street Bridge – This slab bridge over the creek consists of three spans totaling 72 feet with a 32-foot wide concrete deck and 2½' high tubular railings. The concrete abutments for the two end spans are parallel to the channel. The concrete piers that support the end spans and the interior span are square and are parallel to the channel. The end spans are 24 feet long. The interior span is also 24 feet long. The bridge is approximately 14-feet high at the center.

c. East Scott Street Bridge – This pan form girder bridge consists of two spans totaling 70-feet with a 35-foot wide concrete deck and 2-foot railings. This bridge is skewed thirty degrees with respect to the channel. The two spans are approximately 35 feet long. The bridge is approximately 13-feet high at the center.

d. East Broadway Street Bridge – This slab bridge consists of three spans totaling approximately 70-feet long and has a concrete deck that is approximately 38-feet wide with 3-foot railings. The concrete bents each have two square columns. The bridge is approximately 14-feet high at the center.

e. East California Street Bridge – The steel beam bridge located where the creek crosses East California Street is approximately 45-feet wide and 75 feet long. This bridge consists of a single span with six steel stringers. It sports a classic style concrete railing about three feet high and is approximately fifteen feet high at the center.

f. East Main Street Bridge – This steel girder bridge consists of set on a forty degree skew to the channel. Each of three spans is supported by five steel stringers. The steel stringers on the center span over the channel are larger that the steel stringers on the end spans near the abutments. The bridge is about sixty-two feet long and thirty-five feet wide with two-and-a-half foot high steel railings. There are five circular piers at each bent. The bridge is approximately fifteen feet high at the center.

g. Jaycee Park Pedestrian Bridge – The pedestrian bridge is a steel truss structure with a wood plank deck supported on concrete abutments. There are short steel beam approach spans on either side of the steel truss structure.

h. East Garnett Street Bridge – This steel stringer bridge has five steel stringers supporting each of three spans. The steel stringers for the main span over the channel are deeper than the steel stringers for the shorter spans at the abutments. The bridge is about eighty feet long and thirty-eight feet wide. The steel railings are two-and-a-half feet high. There are five circular piers at each bent and the bridge is about nineteen feet high at the center.

i. Moss Street Bridge – The slab bridge on Moss Street has two spans and is about sixty feet long and thirty-five feet wide. It has a two-foot steel railing and is about fourteen feet high at the center. This bridge was later determined to not be in the area of the modified reach, so no modifications were required.

2. DESCRIPTION OF MODIFIED STRUCTURES

a. Belcher Street Bridge – The bridge for Belcher Street will be one hundred thirty-five feet long and fifteen feet high at the channel invert with a thirty-five foot wide deck.

b. Scott Street Bridge – The bridge for Scott Street will be one hundred thirty-five feet long and sixteen feet high at the channel invert with a thirty-eight foot wide deck.

c. Broadway Street Bridge – The bridge for Broadway Street will be one hundred forty feet long and sixteen feet high at the channel invert with a forty-four foot wide deck.

d. California Street Bridge – The bridge for California Street will be one hundred fifty feet long and eighteen feet high at the channel invert with a forty-five foot wide deck.

e. Main Street Bridge – The bridge for Main Street will be one hundred forty-five feet long and seventeen feet high at the channel invert with a thirty-nine foot wide deck.

f. Garnett Street Bridge – The bridge for Garnett Street will be one hundred seventy-five feet long and twenty-one feet high at the channel invert with a thirty-eight foot wide deck.

g. HDR is to design the replacement bridges. If precast-prestressed beams are used the maximum span would be in the neighborhood of one hundred feet so all the bridges would probably be multiple spans. While two spans could be practical for most of the bridges, it may be deemed desirable to go to three spans to keep piers out of the center of the channel.

3. DESIGN CRITERIA REFERENCES

General

Allowable stresses, loading conditions, design assumptions and other criteria were based on applicable parts of the following references unless otherwise noted.

1 Engineering and Design; Strength Design for Reinforced Concrete Structures, EM 1110-2-2104, 30 June 1992.

2 Building Code Requirements for Reinforced Concrete, ACI 318-99.

3 Engineering and Design; Retaining and Flood Walls, EM 1110-2-2502, 29 September 1989.

4 Engineering and Design; Retaining and Flood Walls, ETL 1110-2-322, 15 October
1990

5 Engineering and Design; Structural Design of Concrete Lined Flood Control Channels,
EM 1110-2-2007, 30 April 1995

6 American Association of State Highway and Transportation Officials – Standard Specifications for Highway Bridges

4. DESIGN DATA

a. Unit Loads

Concrete	150 PCF
Water	62.5 PCF

b. Reinforced Concrete Properties

Concrete	f ’c = 3600 psi 4000 psi (bridge slabs)
Reinforcing Steel	fy = 60000 PSI

c. Uplift

Hydrostatic uplift pressure is assumed to act over 100 % of the base of the structures. The drainage system is assumed to be effective in reducing the hydrostatic head by 50%.

d. Bridge Design Loads

1. Vehicular bridges will be designed for an HS 20 live load in accordance with AASHTO.

2. Pedestrian bridges will be designed for 85 psf live load in accordance with AASHTO.

e. Geotechnical Data for Structures

1. Bridges - The proposed bridge structures should be supported on reinforced concrete straight-shaft drilled piers. Based on preliminary subsurface information, the piers should be founded approximately 10 feet below channel bottom depending on location. At this time, an allowable end bearing capacity of 57,400 psf (net) should not be exceeded when sizing the pier shafts. All pier shafts should be a minimum of 18 inches in diameter and reinforced with a minimum of 1 percent reinforcing steel. The load used to size the piers should consist of full dead load plus that portion of the live load that acts more or less continuously, usually 50 percent.

2**.** Small Support-type Structures. Small support-type structures can be supported on reinforced concrete slabs-on-grade with turned-down edge beams. The turned-down edge beam should extend a minimum of 12 inches below outside finished grade, and can be sized for a safe bearing pressure of 2,000 psf (net). Interior beams should be spaced on (maximum) 15-foot centers. Subgrade preparation should consist of providing a minimum of 36 inches of compacted nonexpansive fill below the soil-supported slab.

3. Below-Grade Structures. The following information is provided for the design of all below-grade structures, if applicable. All structures should be designed for at-rest conditions using a lateral earth pressure coefficient (k_o) equal to 0.7. In addition, an allowable bearing capacity of 1,500 psf and a cohesion value (c) of 300 psf should be used. All backfill should be nonexpansive material and can be assumed to have a moist unit weight of 125 pcf.